CT DOT: Process and Procedure Changes for Documenting Storm Water Quality Improvements

CTDOT Designer Training

Conference Room A

10 am, May 6, 2019

Agenda

- **CTDOT MS4 Team & MS4 Background**
- DOT MS4 Permit Overview
- Design Implementation
- Impaired Waters & USGS Water Quality Model

CTDOT MS4 Team

Bureau of Engineering and Construction

Office of Engineering
Environmental Compliance

- Adam Fox P.E.
  Transportation Principal Engineer
- Jason Coite P.E.
- Daniel Imig P.E.

Bureau of Policy and Planning

Office of Environmental Planning

- Kim Lesay
  Assistant Planning Director
- Kevin Carifa
- Jeremy Willcox

MS4 Team Email: DOT.MS4@ct.gov

MS4 Basics

MS4

- Municipal Separate Storm Sewer System
  - a publicly owned stormwater runoff conveyance system
  - discharges to the waters of the U.S.

NPDES

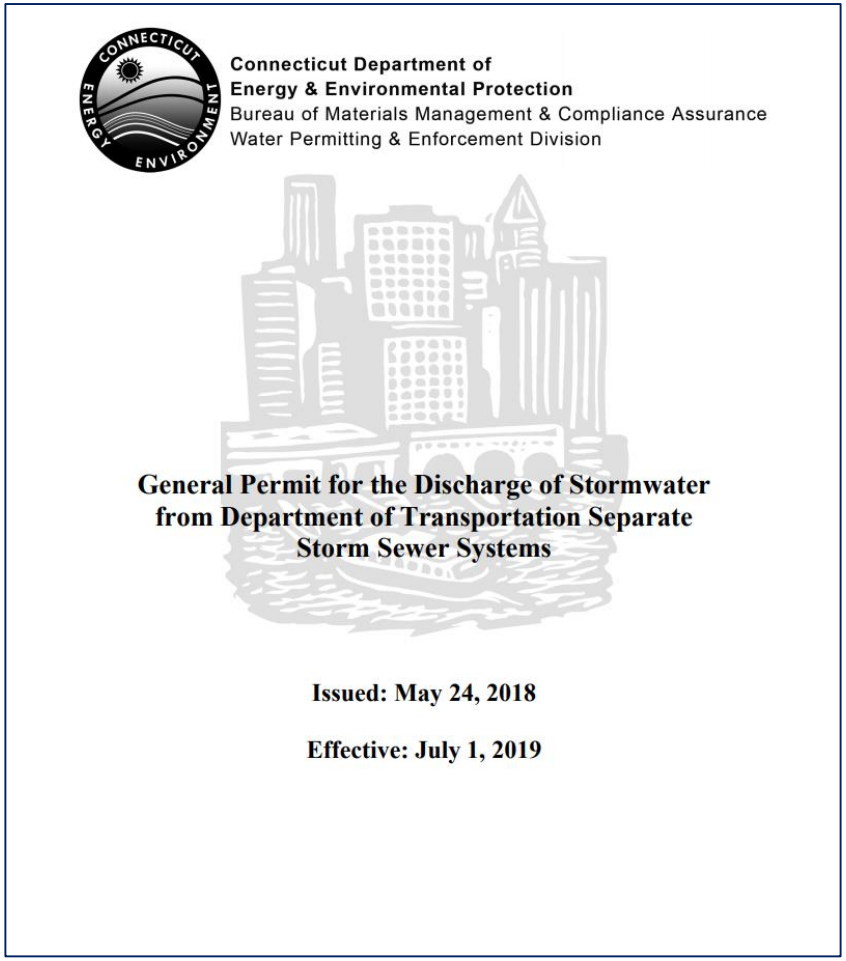
- National Pollutant Discharge Elimination System
  - Permits Issued by Authorized States or EPA

Image from the cover of the Wastewater Facilities Plan for the Town of Fairfield, CT. Draft April 2017. Connecticut Council of Environmental Quality. Retrieved from http://www.ct.gov/ceq/lib/ceq/Fairfield_FacilityPlan_Draft_2017-04-17.pdf

MS4 Basics

2004	• CT DEEP issued Small MS4 General Permit • 113 Towns/Cities
2016	• Draft DOT MS4 General Permit published for public comment
May 2018	• CT DEEP issues Final DOT MS4 General Permit
July 2019	• Effective Date for the DOT MS4 General Permit

DOT MS4 Permit Development


Connecticut Department of
Energy & Environmental Protection
Bureau of Materials Management & Compliance Assurance
Water Permitting & Enforcement Division

General Permit for the Discharge of Stormwater from Department of Transportation Separate Storm Sewer Systems

Issued: May 24, 2018

Effective: July 1, 2019

- CTDOT is considered as a non-traditional municipality
- The DOT MS4 permit
  - based on the Small MS4 General Permit
  - a General Permit for one permittee

DOT MS4 Permit Development

- 14 Sessions Over 18 Months
- Key Mediation Wins

Subject	Original Permit Language	Revised Language
Permit Effective Date	7/1/2018	7/1/2019
Permit Effective Area	Entire State	Municipal MS4 Areas
Mapping	100% - Year 5	50% - Year 5 100% - Year 10
Impaired Waters Screening & Sampling	40% - Year 5 100% - Year 10	Utilize USGS Model for Majority
Impaired Waters Screening & Sampling (Bacteria)	Every Outfall	Representative Outfalls / Scuppers
Mitigation Projects	Within or Outside of DOT ROW (Property Acquisition)	Only Within DOT ROW

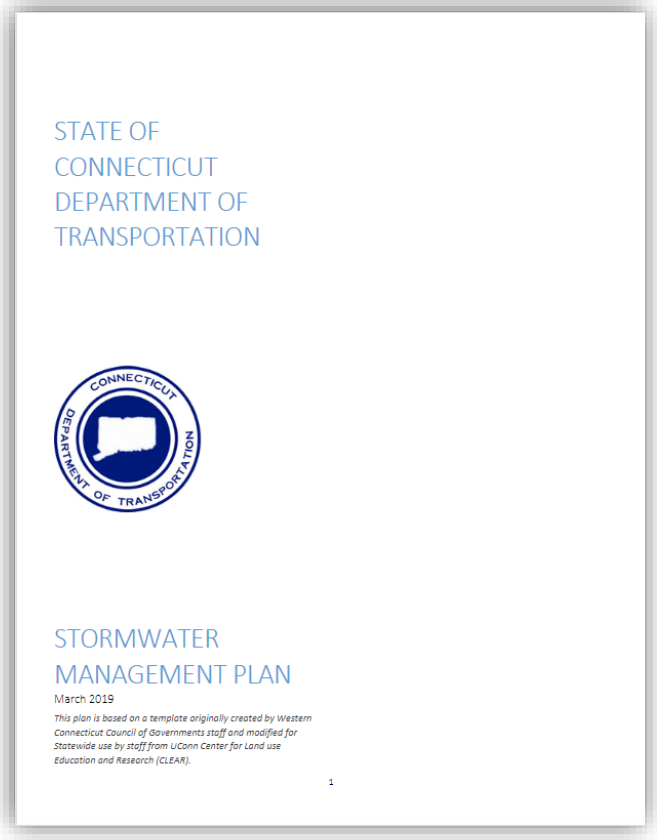
DOT's Stormwater Management Plan

- Plan can be found here:

  https://www.ct.gov/dot/CTDOT-MS4

- Comments on the plan can be sent to:
  DOT.MS4@ct.gov

- Comment Period Ends June 30, 2019


STATE OF
CONNECTICUT
DEPARTMENT OF
TRANSPORTATION

STORMWATER
MANAGEMENT PLAN

March 2019

This plan is based on a template originally created by Western Connecticut Council of Governments staff and modified for Statewide use by staff from UConn Center for Land use Education and Research (CLEAR).

1

Agenda

- CTDOT MS4 Team & MS4 Background
- DOT MS4 Permit Overview
- Design Implementation
- Impaired Waters & USGS Water Quality Model

DOT Permit Overview

- Six Minimum Control Measures (MCMs)
  1. Public Outreach & Education
  2. Public Involvement / Participation
  3. Illicit Discharge Detection & Elimination
  4. Construction Site Stormwater Runoff Control
  5. **Post Construction Stormwater Management**
  6. Pollution Prevention / Good Housekeeping
- Outfall Monitoring Requirements

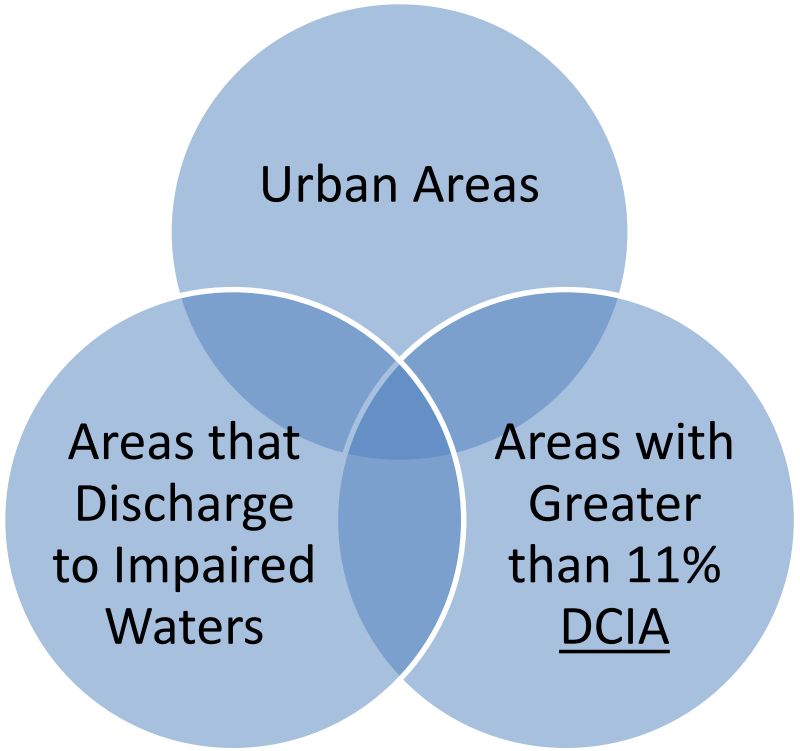
DOT Permit Overview

Maximum Extent Practicable (MEP)

- There must be a serious attempt to comply, and practical solutions may not be lightly rejected
- Factors in determining MEP include
  - Site Constraints
  - Ability to finance
  - Schedule

DOT MS4 Permit Overview

MS4 Priority Areas



Directly Connected Impervious Area

Retrieved from UCONN NEMO "What Type of Impervious Cover do you Have?"
https://nemo.uconn.edu/ic-guide/step2-type.htm

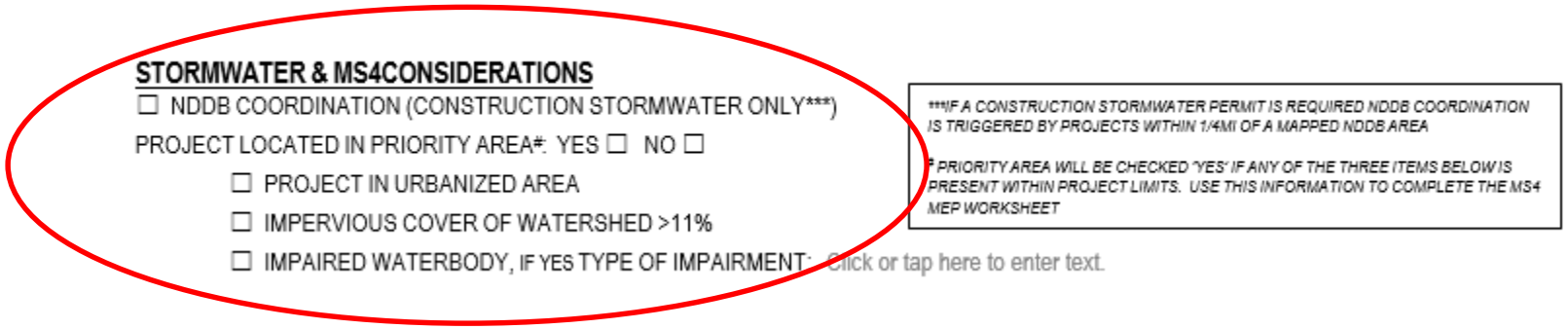
Disconnected DCIA

Retrieved from UCONN NEMO "What Type of Impervious Cover do you Have?"
https://nemo.uconn.edu/ic-guide/step2-type.htm

DOT Permit Overview

Priority Area Information on the Revised PNDF

- Priority area information on the PNDF to be filled out by OEP



STORMWATER & MS4CONSIDERATIONS

☐ NDDB COORDINATION (CONSTRUCTION STORMWATER ONLY***)

PROJECT LOCATED IN PRIORITY AREA#: YES ☐ NO ☐

☐ PROJECT IN URBANIZED AREA

☐ IMPERVIOUS COVER OF WATERSHED >11%

☐ IMPAIRED WATERBODY, IF YES TYPE OF IMPAIRMENT: Click or tap here to enter text.

****IF A CONSTRUCTION STORMWATER PERMIT IS REQUIRED NDDB COORDINATION IS TRIGGERED BY PROJECTS WITHIN 1/4MI OF A MAPPED NDDB AREA*

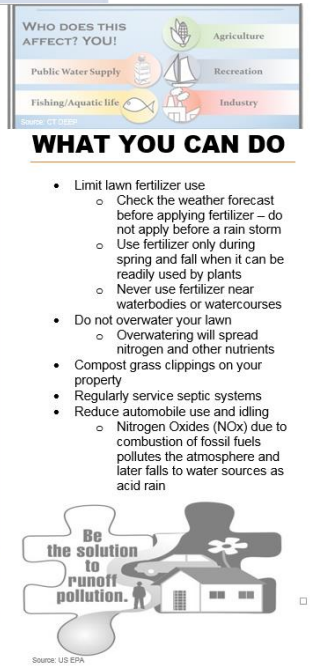
 # PRIORITY AREA WILL BE CHECKED 'YES' IF ANY OF THE THREE ITEMS BELOW IS PRESENT WITHIN PROJECT LIMITS. USE THIS INFORMATION TO COMPLETE THE MS4 MEP WORKSHEET

Screenshot of Draft PNDF Section on MS4 Information

Permit Overview

Public Outreach (MCM 1)

- **Educational Handouts** will be developed by the MS4 team and should be made available at public meetings



Permit Overview

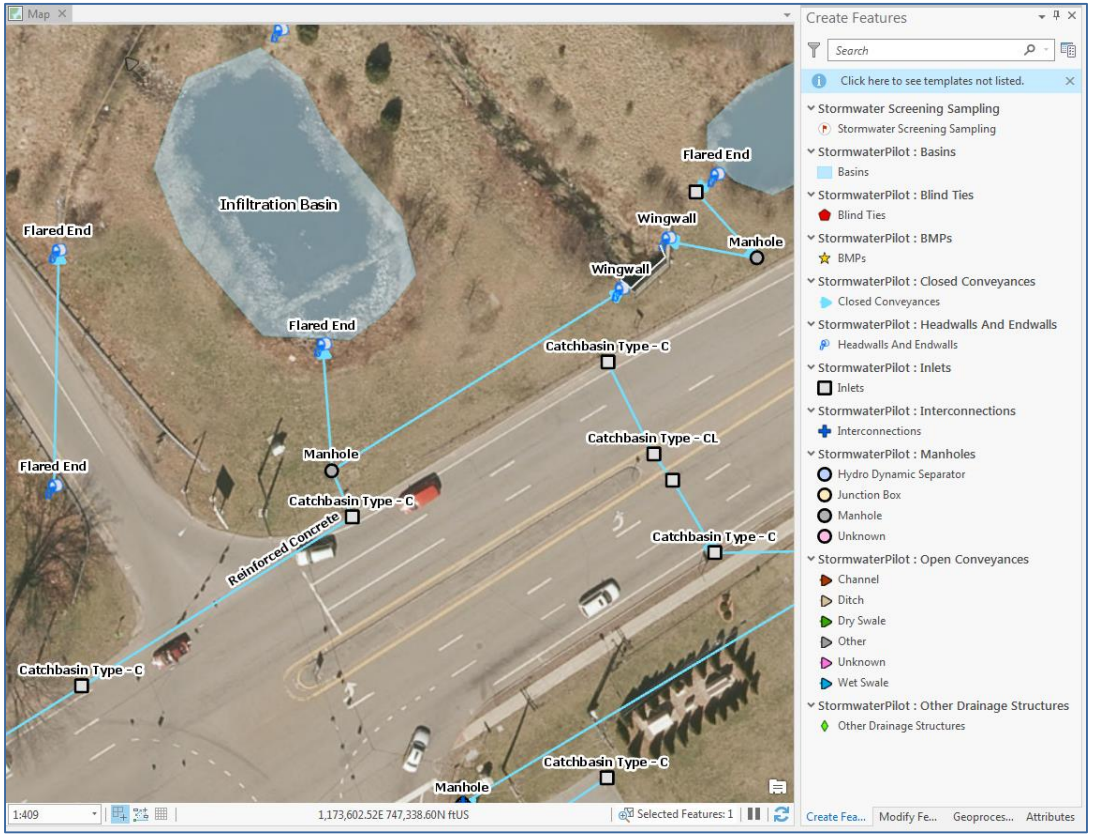
IDDE Mapping Requirements (MCM 3)

- Permit:
  - Half the system must be mapped within 5 years
  - Map the rest within 10 years
- Goal: map 10% of system every year
  - CADD → GIS
  - Digitization of older plans
  - Field mapping/verification

MCM 3 - IDDE

Mapping DOT's Stormwater System

- Starting from scratch
- Mapping Standardization
  - COG's GIS Standards Committee
  - DOT schema will be the basis of the State Standard
- Long-term: Sharing MS4 interconnection data with municipalities



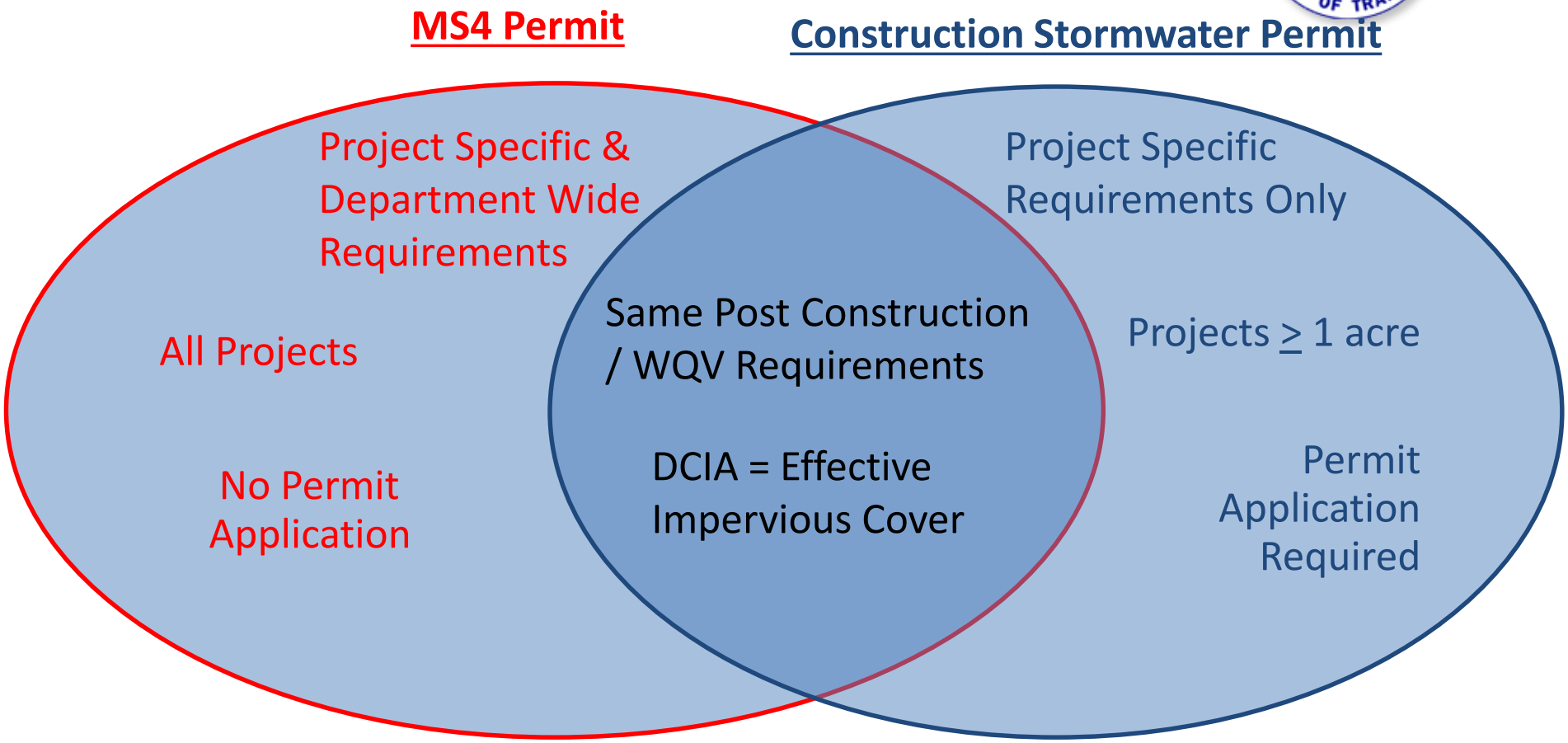
Screenshot of CTDOT GIS Stormwater Map Beta Test

Permit Overview

Post-Construction Requirements (MCM 5)

- Same post-construction requirements as construction general permit
  - Project Area ≥40% Impervious Area → Retain ½ WQV
  - Project Area <40% Impervious Area → Retain Full WQV
- **Applies to all projects**
  - **No 1 acre of disturbance threshold**
- Incorporate concept designs into 30%

MS4 Permit – Construction Permit



Permit Overview

Post-Construction Requirements (MCM 5)

DCIA Disconnections

- Disconnect 2% of DCIA by 2024
- DCIA reductions to come from BMPs incorporated into projects
- Must document DCIA on every project
- Annual Reporting Requirement
- Projects that add DCIA will need to be offset by another
- Long-term: Stand alone retrofit projects

Agenda

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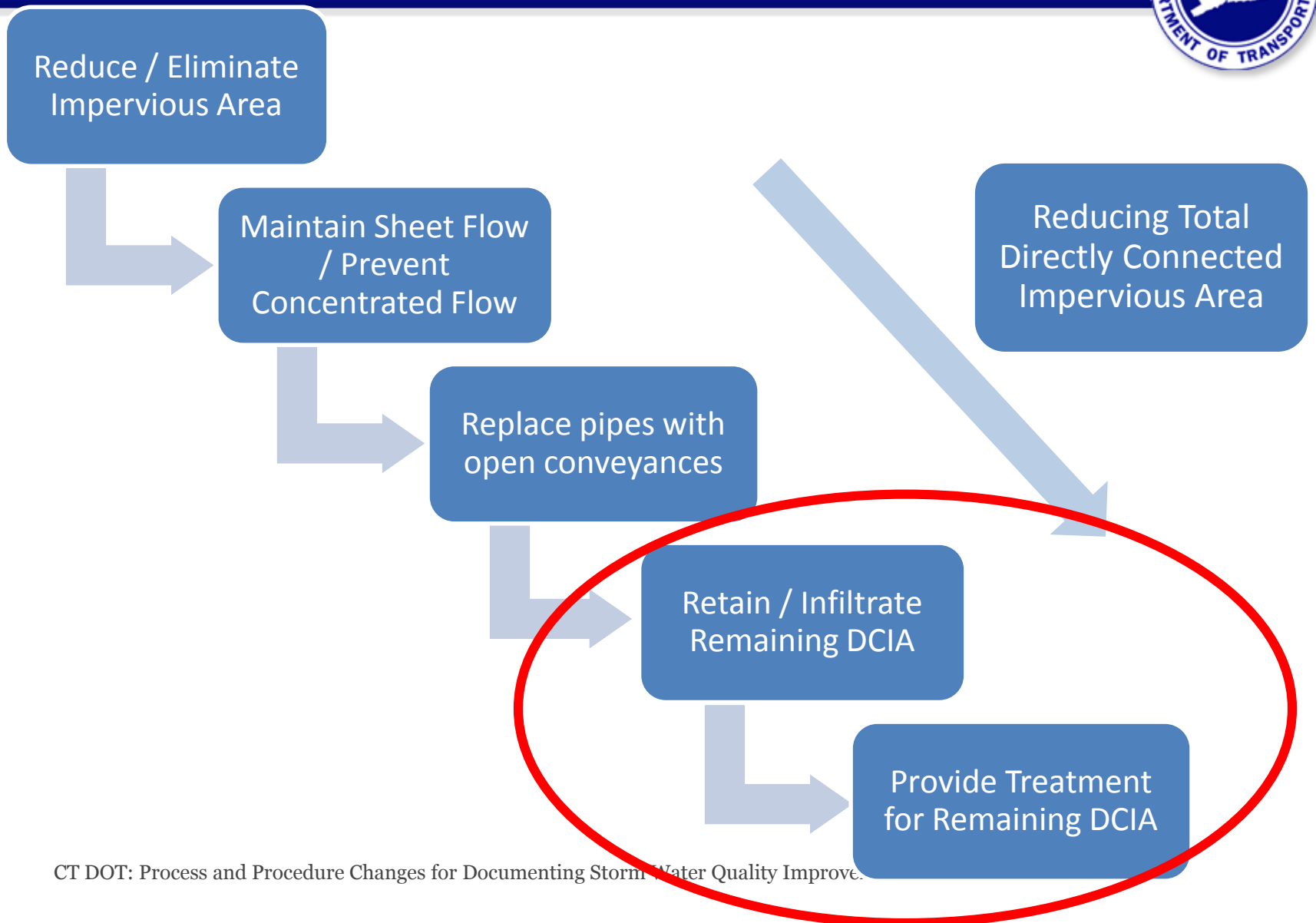
Design Implementation

Post-Construction Requirements (MCM 5)

DCIA Disconnections

- Disconnect 2% of DCIA by 2024
  - **<u>Initial DCIA reductions to come from currently planned projects</u>**
- Must document DCIA on every project
- Annual Reporting Requirement
- Projects that add DCIA will need to be offset by another
- Long-term: Stand alone retrofit projects

Design Process – Reducing DCIA



DCIA DISCONNECTIONS

- Disconnections to be achieved through Stormwater BMPs on a project level

DISCONNECTED = the *WQV Retention Goal* is retained

= the *WQV Retention goal* is treated if it can't be retained

= the *WQV Retention goal* is retained and/or treated somewhere else within the DOT R.O.W. and within the same subregional drainage basin

Pre- and post-construction DCIA must be tracked for each project affecting drainage

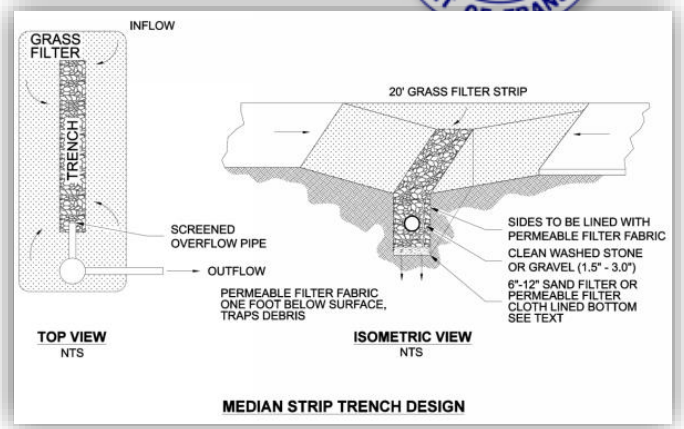
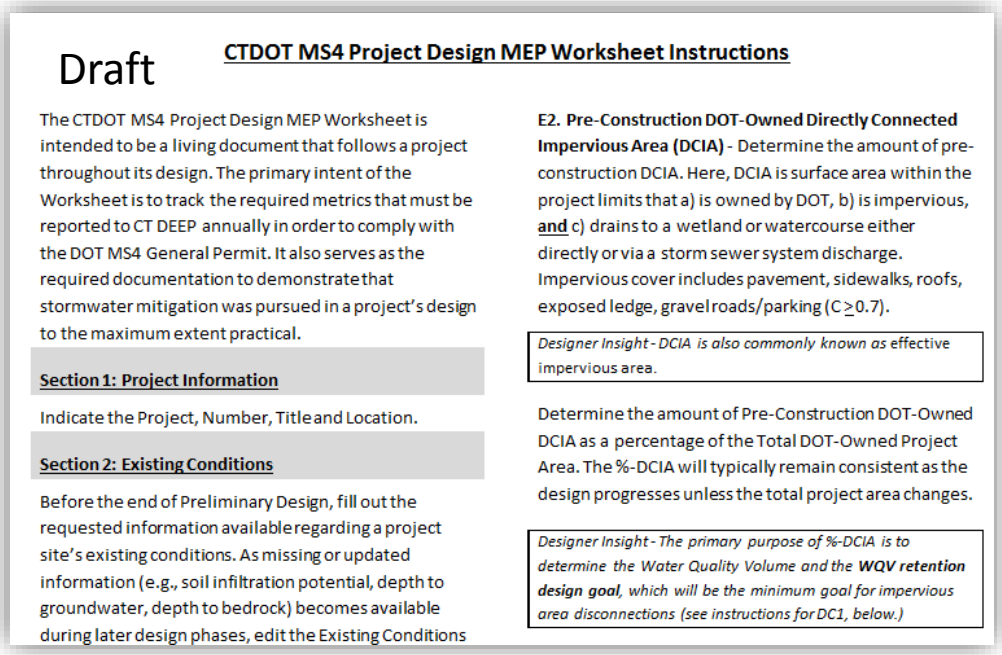


Image from the Washington DOT Highway Runoff Manual (Figure 5-44, Pg. 5-144). Dated April 2014 with supplement February 2016.
https://www.wsdot.wa.gov/publications/manuals/fulltext/M31-16/highwayrunoff.pdf

Image from the Washington DOT Highway Runoff Manual, Engineered Dispersion, Pg. 5-181. Dated April 2014 with supplement February 2016.
https://www.wsdot.wa.gov/publications/manuals/fulltext/M31-16/highwayrunoff.pdf

Design Implementation

- Maximum Extent Practicable (MEP)
- Engineering Directive
  - Designer Worksheet
  - Instructions
  - Examples
  - BMP Matrix
  - BMP One-Pagers



Draft

CTDOT MS4 Project Design MEP Worksheet Instructions

The CTDOT MS4 Project Design MEP Worksheet is intended to be a living document that follows a project throughout its design. The primary intent of the Worksheet is to track the required metrics that must be reported to CT DEEP annually in order to comply with the DOT MS4 General Permit. It also serves as the required documentation to demonstrate that stormwater mitigation was pursued in a project's design to the maximum extent practical.

Section 1: Project Information

Indicate the Project, Number, Title and Location.

Section 2: Existing Conditions

Before the end of Preliminary Design, fill out the requested information available regarding a project site's existing conditions. As missing or updated information (e.g., soil infiltration potential, depth to groundwater, depth to bedrock) becomes available during later design phases, edit the Existing Conditions

E2. Pre-Construction DOT-Owned Directly Connected Impervious Area (DCIA) - Determine the amount of pre-construction DCIA. Here, DCIA is surface area within the project limits that a) is owned by DOT, b) is impervious, **and** c) drains to a wetland or watercourse either directly or via a storm sewer system discharge. Impervious cover includes pavement, sidewalks, roofs, exposed ledge, gravel roads/parking ($C \geq 0.7$).

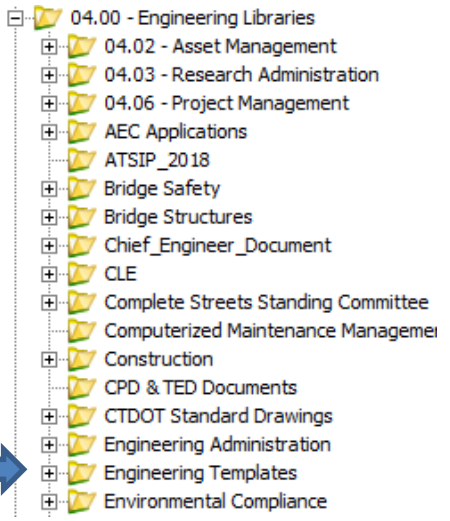
Designer Insight - DCIA is also commonly known as effective impervious area.

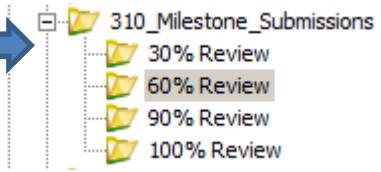
Determine the amount of Pre-Construction DOT-Owned DCIA as a percentage of the Total DOT-Owned Project Area. The %-DCIA will typically remain consistent as the design progresses unless the total project area changes.

Designer Insight - The primary purpose of %-DCIA is to determine the Water Quality Volume and the ***WQV retention design goal****, which will be the minimum goal for impervious area disconnections (see instructions for DC1, below.)*

DOT MS4 Project Design MEP Worksheet

- Worksheet Template found in 2 places
  - **https://www.ct.gov/dot/CTDOT-MS4**
  - Projectwise/4.00 Engineering Libraries/Engineering Templates
- Instructions are also available
- Save completed worksheets for each phase
  - Project Number / 310_Milestone_Submissions
- AEC's Digital Project Manual will be updated
- Comments on Draft Engineering Directive expected by April 10, 2019





DOT MS4 Project Design MEP Worksheet

CTDOT MS4 Project Design Maximum Extent Practicable (MEP) Worksheet		
Section 1: Project Information	Number:	
	Title:	
	Location:	

Section 2: Existing Conditions			
EC1	Total DOT-Owned Project Area		
EC2	Pre-construction DOT-Owned Directly Connected Impervious Area (DCIA):		
EC3	Soil Infiltration Potential	Data Source: ☐Existing Report / Soils Map ☐Field Verified	
EC4	Depth to Groundwater Table		☐TBD
EC5	Depth to Bedrock		☐TBD
EC6	Aquifer Protection Area? (from PNDF)		
EC7	MS4 Priority Area? (from PNDF)		
	Check All That Apply	☐Urbanized Area	☐DCIA >11%
	Select All Impairments That Apply	Choose an item.	Choc
EC8	Contamination known or suspected to be present? (From Environmental Compliance)		
EC9	Adjoining DOT ROW beyond project limits available for stormwater quality management		

Section 3: Designed Condition								
	Water Quality Calculations	30% Design						
DC1	WQV retention design goal		ac-ft	☐ TBD				
DC2	WQV goal ***retained*** (refer to page 2)			ac-ft				
DC3	WQV goal ***treated*** (refer to page 2)			ac-ft				
DC4	Total WQV *retained or treated*			ac-ft				
DC5	Post-construction DCIA(acres)		ac.	☐ TBD				
DC6	Pre-construction DCIA (refer to EC2 above)			ac.		ac.		ac.
DC7	Change in DCIA from pre- to post-construction *Can be positive (DCIA gained) or negative (DCIA lost)*		ac.	☐ TBD		ac.		ac.
	Date completed							
	Completed by (initials)							
	Reviewed by (initials)							

Notes:

Section 2: Existing Conditions					
EC1	Total DOT-Owned Project Area		_____ acres		
EC2	Pre-construction DOT-Owned Directly Connected Impervious Area (DCIA):		_____ acres	_____%	
EC3	Soil Infiltration Potential	Data Source: ☐Existing Report / Soils Map ☐Field Verified	☐Good	☐Fair	☐Poor ☐Mixed
EC4	Depth to Groundwater Table	☐TBD	_____ to _____ ft below grade		
EC5	Depth to Bedrock	☐TBD	_____ to _____ ft below grade		
EC6	Aquifer Protection Area? (from PNDF)		☐Yes	☐No	
EC7	MS4 Priority Area? (from PNDF)		☐Yes (See Below)	☐No	
	Check All That Apply	☐Urbanized Area	☐DCIA >11%	☐Impaired Waterbody (See Below)	
	Select All Impairments That Apply	Choose an item.	Choose an item.	Choose an item.	
EC8	Contamination known or suspected to be present? (From Environmental Compliance)		☐Yes	☐No	
EC9	Adjoining DOT ROW beyond project limits available for stormwater quality management		_____ acres		

DOT MS4 Project Design MEP Worksheet

CTDOT MS4 Project Design
Maximum Extent Practicable (MEP) Worksheet

Section 1: Project Information	**Number:**	
	Title:	
	Location:	

Section 2: Existing Con

EC1	Total DOT-Owned Project Area	
EC2	Pre-construction DOT-Owned Directly Connected Impervious Area (DCIA):	
EC3	Soil Infiltration Potential	Data Source: ☐Existing Report / Soils Map ☐Field Verified
EC4	Depth to Groundwater Table	☐
EC5	Depth to Bedrock	☐
EC6	Aquifer Protection Area? (from PNDF)	
EC7	MS4 Priority Area? (from PNDF)	
	Check All That Apply	☐Urbanized Area ☐DCIA >1
	Select All Impairments That Apply	Choose an item.
EC8	Contamination known or suspected to be present? (From Environmental Compliance)	
EC9	Adjoining DOT ROW beyond project limits available for storm quality management	

Section 3: Designed Cor

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	Date completed				
	Completed by (initials)				
	Reviewed by (initials)				

Notes:

Section 3: Designed Conditions

	Water Quality Calculations	30% Design		60% Design	90% Design	FDP
DC1	WQV retention design goal	ac-ft ☐ TBD		ac-ft	ac-ft	ac-ft
DC2	WQV goal ***retained*** (refer to page 2)	ac-ft		ac-ft	ac-ft	ac-ft
DC3	WQV goal ***treated*** (refer to page 2)	ac-ft		ac-ft	ac-ft	ac-ft
DC4	Total WQV *retained or treated*	ac-ft		ac-ft	ac-ft	ac-ft
DC5	Post-construction DCIA(acres)	ac. ☐ TBD		ac.	ac.	ac.
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	Date completed					
	Completed by (initials)					
	Reviewed by (initials)					

Notes:

DOT MS4 Project Design MEP Worksheet

Section 4: Stormwater BMP Selection Summary			
Design Phase ☐30% ☐60% ☐90% ☐FDP	WQV Retained per 1" of Rainfall (ac-ft)	WQV Treated (ac-ft)	Site Constraints
Disconnection			
No curb / natural dispersion			Choose an item.
Vegetative filter strip			Choose an item.
Other			Choose an item.
Conveyance & Disconnection			
Grass channel			Choose an item.
Water quality swale (dry)			Choose an item.
Other			Choose an item.
Infiltration / Retention			
Infiltration basin			Choose an
Infiltration trench			Choose an
Underground infiltration system			Choose an
Dry well			Choose an
Other			
Treatment			
Wet basin / wetland system			Choose an
Extended dry detention basin			Choose an
Hydrodynamic-oil/grit sys.			Choose an
Bioretention with underdrain			Choose an
Other			
TOTAL			
Notes:			

- Choose an item.
- Insufficient Right of Way
- Utility Conflict
- Contaminated soils >RSRs AND soil cannot be relocated/ disposed
- Groundwater elevation less than 3' from bottom of infiltration unit
- Bedrock less than 3' from bottom of infiltration unit
- Mapped Hydrologic Soil Group D
- Field measured infitlration <0.3 in/hr
- Field measured infiltration >5.0 in/hr
- Natural slopes >15%
- Cost Prohibitive
- not applicable
- other - describe in comment section

DOT MS4 Project Design MEP Worksheet

CTDOT MS4 Project Design
Maximum Extent Practicable (MEP) Worksheet

Section 1: Project Information	Number:	
	Title:	
	Location:	

Section 2: Existing Con

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	Check All That Apply	☐Urbanized Area ☐DCIA >1
	Select All Impairments That Apply	Choose an item
EC8	Contamination known or suspected to be present (From Environmental Compliance)	
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	Date completed				
	Completed by (initials)				
	Reviewed by (initials)				

Notes:

Section 3: Designed Conditions

	Water Quality Calculations	30% Design		60% Design		90% Design		FDP	
DC1	WQV retention design goal		ac-ft ☐ TBD		ac-ft	0.35	ac-ft		ac-ft
DC2	WQV goal ***retained*** (refer to page 2)		ac-ft		ac-ft	0.04	ac-ft		ac-ft
DC3	WQV goal ***treated*** (refer to page 2)		ac-ft		ac-ft	0.12	ac-ft		ac-ft
DC4	Total WQV *retained or treated*		ac-ft		ac-ft	0.16	ac-ft		ac-ft
DC5	Post-construction DCIA(acres)		ac. ☐ TBD		a	7.16	a		ac.
DC6	Pre-construction DCIA (refer to EC2 above)		ac.		ac.	7.27	ac.		ac.
DC7	Change in DCIA from pre- to post-construction *Can be positive (DCIA gained) or negative (DCIA lost)*		ac. ☐ TBD		ac.	-0.11	ac.		ac.
	Date completed								
	Completed by (initials)								
	Reviewed by (initials)								

Notes:

BMP Matrix

DRAFT

Type of BMP	BMP	Pretreatment Practice	Runoff Reduction (First 1" Of Runoff)	Pollutant Removal Efficiency	Approximate Footprint Size	Recommended Contributing Drainage Area (DA)	Typical Soil Types (NRCS: A, B, C, D)	Use in High Water Table	Use in Contaminated Soil or Groundwater	Use in Aquifer Protection Area	*Approximate Capital Cost (1" Treated per Acre)	Annual Average O&M Cost	Comments
Simple Disconnection	Natural Dispersion Area		Varies	Low to Moderate	≥ DA Preferred	Limited to 75' of run-on from Imp. Areas (IA)	Any	X	X	X	N/A	Low	Concentrated flow requires use of level spreader prior to beginning of dispersion area
	Vegetative Filter Strip	X	Varies	Low to Moderate	DA or 25' Min. Width	Limited to 75' of run-on from Imp. Areas (IA)	Any	X	X	X	<$5,000	Low	Soil amendments can be added to increase infiltration. Concentrated flow requires use of level spreader prior to beginning of dispersion area
Conveyance	Grass Channel	X	Low to Moderate	Low to Moderate	N/A	< 5 Acres	Any	X		X	<$5,000	Low	Soil amendments can be added to increase infiltration.
	Water Quality Swale (Dry)		Low	Moderate to High	6 - 10% of DA	< 5 Acres	A, B			X	$10,000 - $60,000	Moderate	Can be installed with or without an underdrain depending on soils
	Water Quality Swale (Wet)		None	Moderate to High	6 - 10% of DA	< 5 Acres	C, D	X		X	$10,000 - $60,000	Moderate	
Infiltration or Filtration (w/underdrain)	Infiltration Trench		High	High	4-20% of DA	< 5 Acres	A, B, C*, D*				$45,000	Moderate-High	Footprint size influenced heavily by infiltration rate. *Could add underdrain for locations with poor soils
	Infiltration Basin		High	High	4-10% of DA	< 25 Acres	A, B				$23,000-$90,000	Moderate-High	Footprint size influenced heavily by infiltration rate
	Dry Well / Leaching Catch Basin		High	Low	5-10% of DA	1 Acre or Less	A, B				$35,000	Low-Moderate	Footprint size influenced heavily by infiltration rate & depth to groundwater
	Permeable Pavement		High	Low to Moderate	DA	N/A	A, B				$20,000 - $66,000	High	Pervious asphalt typically have lower capital cost than pervious concrete
	Bioretention		Varies	High	5-10% of DA	< 2 Acres	Any with Underdrain				$56,000	Moderate-High	Can be installed with or without an underdrain depending on soils.
	Sand Filter w/underdrain		None	High	1-5% of DA	<10 Acres	Any with Underdrain			X	$65,000	High	Sand filters should be considered when targeting removal of specific pollutants including nitrogen, phosphorus, sediment, metals and bacteria
Wet Ponds / Wetlands	Wet Pond		None	High	2-5% of DA	> 25 Acres	C, D	X		X	$10,000 - $25,000	Low - Moderate	A sediment forebay is required. Smaller contributing drainage areas are acceptable if groundwater flow.
	Constructed Shallow Wetland		None	High	5-10% of DA	> 10 Acres	C, D	X			$11,000	Moderate	
	Subsurface Gravel Wetland		None	High	10-15% of DA	< 10 Acres	C, D	X			$33,000	Moderate	
Proprietary / Structural BMPs	Hydrodynamic Separator	X	None	Low	5' - 10' Diameter Manhole	Per Manufacturer	Any		X	X	$10,000 - $30,000	Low	
	Oil / Grit Separator	X	None	Low	Range from 3'x6' up to 8'x16'	Per Manufacturer	Any		X	X	$10,000 - $30,000	Low	

Design Process

- BMP Categories
  - Simple Disconnection
  - Open Conveyance
  - Infiltration (Retains WQV)
  - Treatment
    - Filtration
    - Wet Systems
    - Proprietary BMPs
      - (Hydrodynamic Separators)

Simple Disconnection

Image from the Washington DOT Highway Runoff Manual, Engineered Dispersion, Pg. 5-181. Dated April 2014 with supplement February 2016. https://www.wsdot.wa.gov/publications/manuals/fulltext/M31-16/highwayrunoff.pdf

IA Runoff into

Natural Dispersion Areas &

Vegetated Filter Strips

Disconnected

Insufficient Area

DC5	Post-construction DCIA(acres)

Retain / Infiltrate

DC2	WQV goal ***retained*** (refer to page 2)

Treatment

DC3	WQV goal ***treated*** (refer to page 2)

Infiltration / Filtration Practices

Dry Well

Image from the Washington DOT Highway Runoff Manual. Dry Well, Pg. 5-156. Dated April 2014 with supplement February 2016. https://www.wsdot.wa.gov/publications/manuals/fulltext/M31-16/highwayrunoff.pdf

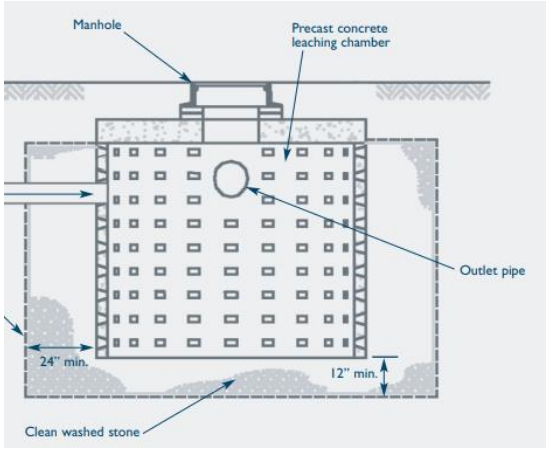
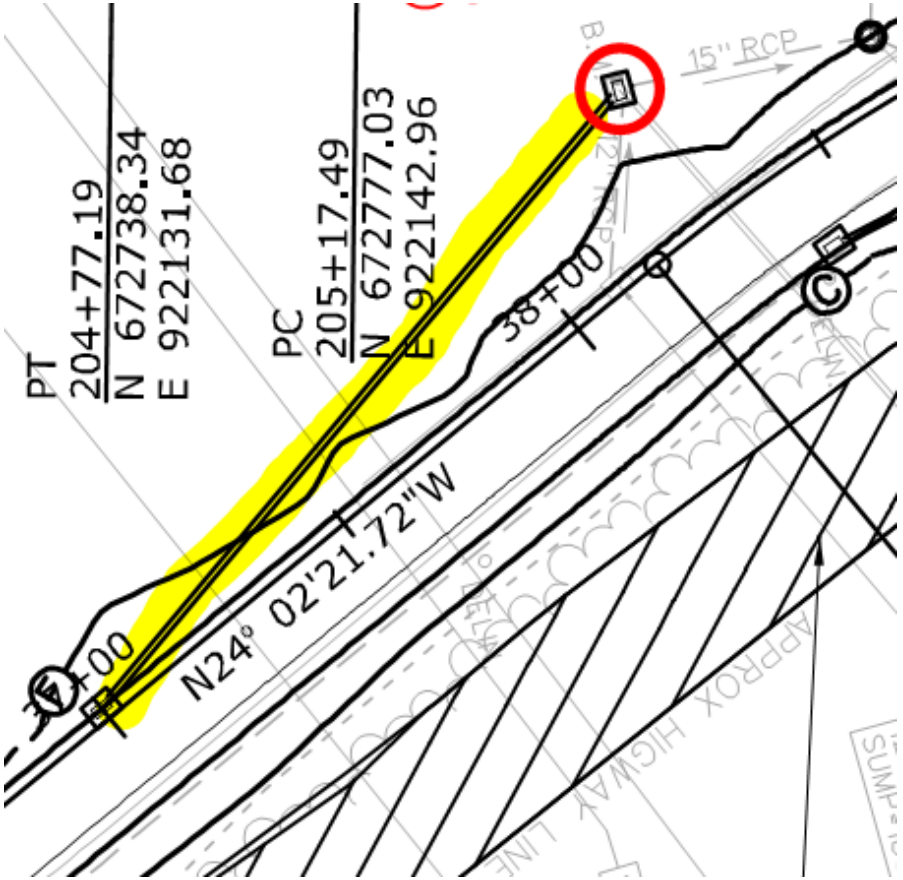
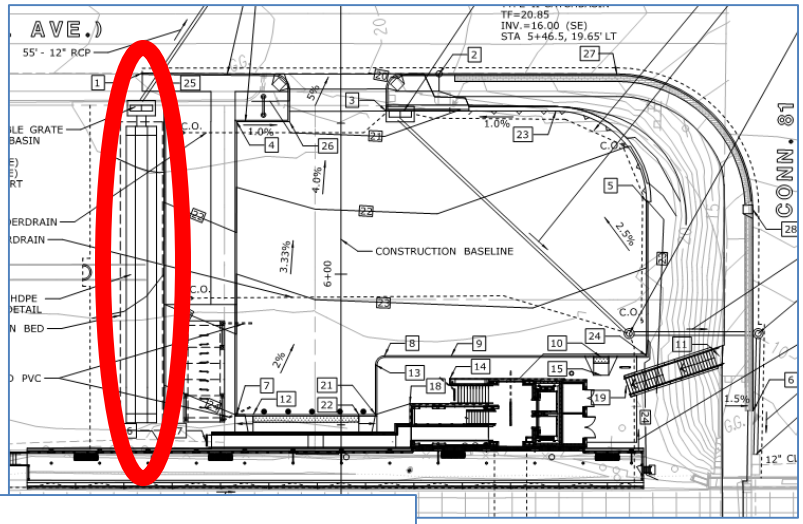


Image from the 2004 CT Stormwater Quality Manual, Dry Well, Pg. 11-S5-4. https://www.ct.gov/deep/lib/deep/water_regulating_and_discharges/stormwater/manual/CH11_DW_S-5.pdf

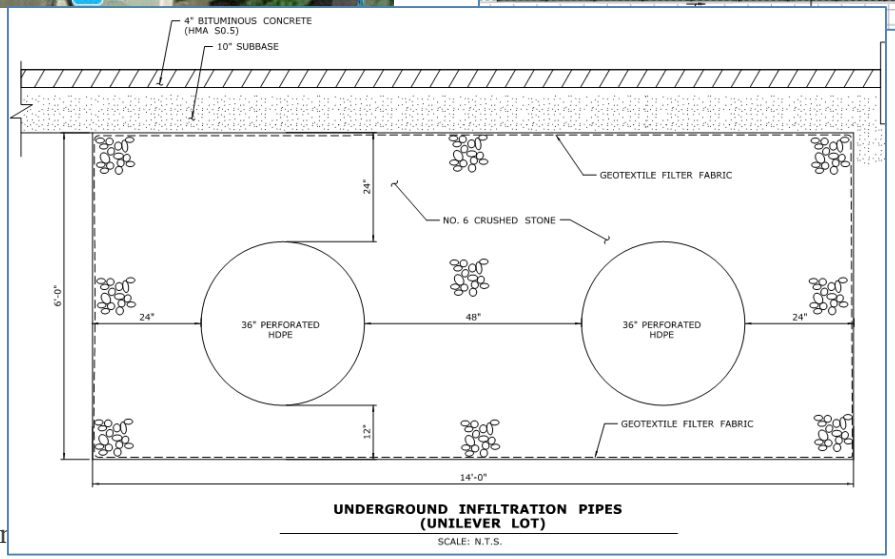


Infiltration / Filtration Practices

Underground Infiltration & Detention System



0310-0059 - Shore Line East Railroad Station Redevelopment



Infiltration / Filtration Practices

Infiltration Trench

Image from the Washington DOT Highway Runoff Manual, Engineered Dispersion, Pg. 5-140. Dated April 2014 with supplement February 2016.
https://www.wsdot.wa.gov/publications/manuals/fulltext/M31-16/highwayrunoff.pdf

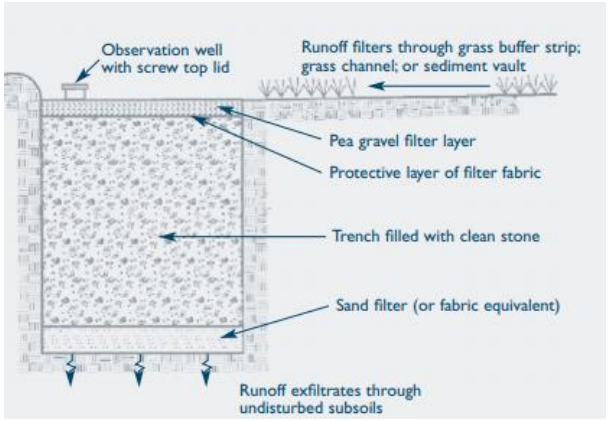


Image from the 2004 CT Stormwater Quality Manual, Infiltration Practice, Pg. 11-P3-5
https://www.ct.gov/deep/lib/deep/water_regulating_and_discharges/stormwater/manual/CH11_DW_S-5.pdf

Water Quality Swale

Image from the MA Stormwater Handbook, Volume 2, Chapter 2, Water Quality Swale, Pg. 77
https://www.mass.gov/files/documents/2016/08/qi/v2c2.pdf

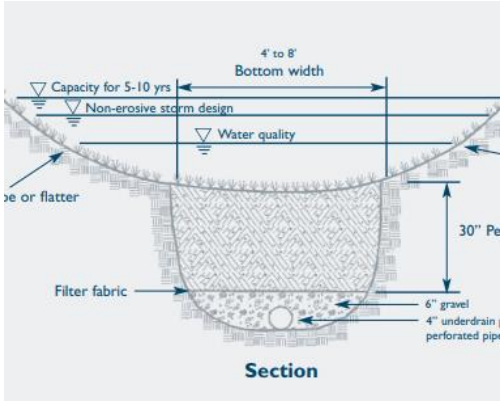


Image from the 2004 CT Stormwater Quality Manual, Water Quality Swales, Pg. 11-P5-3
https://www.ct.gov/deep/lib/deep/water_regulating_and_discharges/stormwater/manual/CH11_WQ_P-5.pdf

Basins

- Sediment Basin
  - Temporary Construction BMP
- Detention Basin
  - Peak Flow Management
  - No Volume Reduction
  - Variations
    - Dry Basin, Extended Dry Basin
    - Wet Basin (“Treatment” BMP)
- Infiltration Basin (“Retention” BMP)
  - Must be constructed over permeable soils

BMP One-Pagers

Infiltration Basin

Description: A constructed impoundment that captures and infiltrates the design water quality volume over serval days. Infiltration basins should be designed off-line to bypass larger flows and only manage the water quality volume.

BMP Information

BMP Type: Runoff Reduction

Targeted Pollutants: Bacteria, sediment, phosphorus, nitrogen, metals

Design Considerations

Drainage Area: 10 acres or less recommended

Sizing: Volume equal to water quality volume

Depth: 3' ideal, 6' maximum

Pretreatment: 25% of the water quality volume captured in sediment forebay

Soils: NRCS Hydrologic Soil Groups A and B

Infiltration Rate: Minimum of 0.30 in/hr

Drain Time: 12 hours min / 48 hours max

Limitations

No aquifer protection areas

No brownfield areas

Seasonal high water table must be ≥ 3' below bottom

Cost Considerations:

Capital Cost: Moderate

O&M Cost: Moderate to High

Maintenance Requirements

Bi-annual inspections

Mowing grass areas

Remove trash and debris

Clean sediment forebay

Notes:

Utilize half of the field measured infiltration rate for design purposes

Do not use infiltration basins as temporary sediment traps during construction

Basins may be equipped with an underdrain system for dewatering when the system becomes clogged

References:

2004 Connecticut Stormwater Quality Manual - http://www.ct.gov/deep/cwp/view.asp?a=2721&q=325704

Massachusetts Stormwater Handbook - https://www.mass.gov/files/documents/2016/08/qi/v2c2.pdf

New Jersey Stormwater BMP Manual - http://www.njstormwater.org/bmp_manual2.htm

Virginia Stormwater BMP Clearinghouse - http://www.vwrrc.vt.edu/swc/NonProprietaryBMPs.html

Washington State DOT Highway Runoff Manual - https://www.wsdot.wa.gov/publications/manuals/fulltext/M31-16/highwayrunoff.pdf

Infiltration Trench

Description: Shallow, excavated, stone-filled trenches in which groundwater is collected and infiltrated into the ground. Infiltration trenches can be constructed at a ground surface depression to intercept overland flow or can receive piped runoff

BMP Information

BMP Type: Runoff Reduction

Targeted Pollutants: Bacteria, sediment, phosphorus, nitrogen, metals

Design Considerations

Drainage Area: 5 acres or less; 2 acres recommended

Sizing: Volume equal to water quality volume

Trench Depth: 2 to 10 feet

Pretreatment: 25% of the water quality volume captured in sediment forebay or equivalent

Soils: NRCS Hydrologic Soil Groups A and B

Infiltration Rate: Minimum of 0.30 in/hr

Drain Time: 12 hours min / 48 hours max

Limitations

No aquifer protection areas

No brownfield areas

Seasonal high water table must be ≥ 3' below bottom

Cost Considerations:

Capital Cost: Moderate

O&M Cost: Moderate to High

Maintenance Requirements

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New Jersey Stormwater BMP Manual - http://www.njstormwater.org/bmp_manual2.htm

Virginia Stormwater BMP Clearinghouse - http://www.vwrrc.vt.edu/swc/NonProprietaryBMPs.html

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Agenda

- CTDOT MS4 Team & MS4 Background
- DOT MS4 Permit Overview
- Design Implementation
- Impaired Waters & USGS Water Quality Model

Impaired Waters Monitoring

USGS will monitor 9 representative outfalls

- Locations were selected based on land use, impervious area, and traffic
- 2 years of continuous monitoring for each out-fall

CTDOT Photo of USGS building an outfall monitoring station in Glastonbury

Impaired Waters Monitoring

- In addition, each outfall sampled 15 to 18 times
  - 18 constituents listed in the DOT MS4 permit
  - 26 additional analytes
- Sampling results will be added to FHWA stormwater runoff database
- Monitoring and sampling results to be used in USGS's model for predicting roadway impacts to water quality

USGS Water Quality Model

S.E.L.D.M.

- **S**tochastic **E**mpirical **L**oading **D**ilution **M**odel
- Highway Runoff Quality Model
  - Developed by USGS with the FHWA
  - Utilized by other DOTs
    - Washington
    - Oregon
    - Colorado
    - Massachusetts

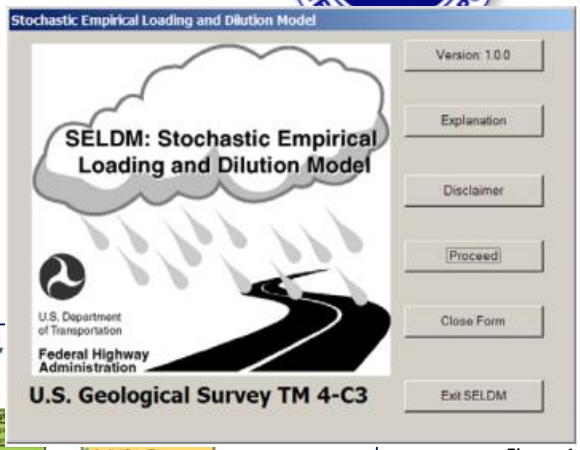


Figure 1

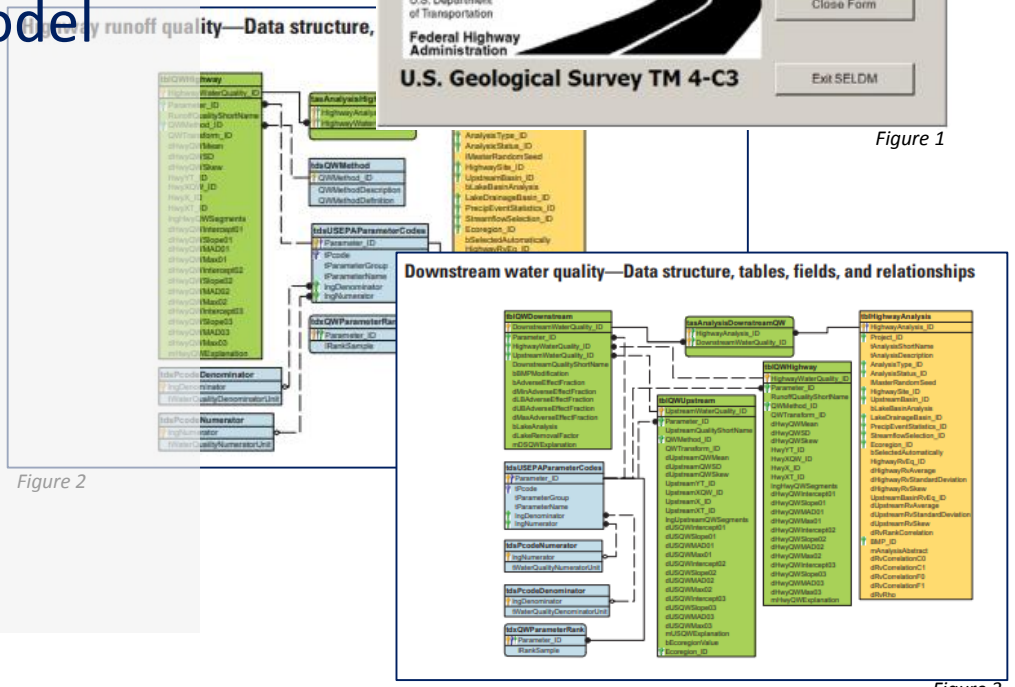


Figure 2

Figure 3

Figure 1 – SELDM Opening form. Stochastic Empirical Loading and Dilution Model (SELDM) Version 1.0.0-Appendix 4. Navigating the Graphical User Interface. U.S. Geological Survey Techniques and Methods 4–C3. Retrieved from https://pubs.usgs.gov/tm/04/c03/tm4-C3_final_508_files/tm4-C3_apdx4_v030813.pdf

Figure 2 – Highway runoff quality—Data structure, tables, fields, and relationships. Stochastic Empirical Loading and Dilution Model (SELDM) Version 1.0.0—Appendix 3. Selected relational diagrams showing the structure of the database U.S. Geological Survey Techniques and Methods 4–C3. Retrieved from https://pubs.usgs.gov/tm/04/c03/tm4-C3_final_508_files/tm4-C3_apdx3_plate_v022513.pdf

Figure 3 – Downstream water quality—Data structure, tables, fields, and relationships. Stochastic Empirical Loading and Dilution Model (SELDM) Version 1.0.0—Appendix 3. Selected relational diagrams showing the structure of the database U.S. Geological Survey Techniques and Methods 4–C3. Retrieved from https://pubs.usgs.gov/tm/04/c03/tm4-C3_final_508_files/tm4-C3_apdx3_plate_v022513.pdf

USGS Water Quality Model

SELDM: How will it be used?

- SELDM to be run on all mapped outfalls by the end of the permit term
  - Schedule tied to mapping
- Evaluate DOT's impact on a receiving waterbodies
- Model results will be used as basis for follow up investigations and implementation of BMPs
- Model will be used to develop Retrofit Program

Water Quality Model

Benefits of SELDM

- Aligns with overall DCIA reduction requirements
- Model will determine water quality impacts of project and potential BMPs to consider
- More of a desktop analysis than field activity
- Model to be run on mapped outfalls

Water Quality Model

FIRST PHASE

- First phase of modeling will identify watersheds where DOT operations have no impact
- Develop retrofit projects within proposed project limits

FUTURE

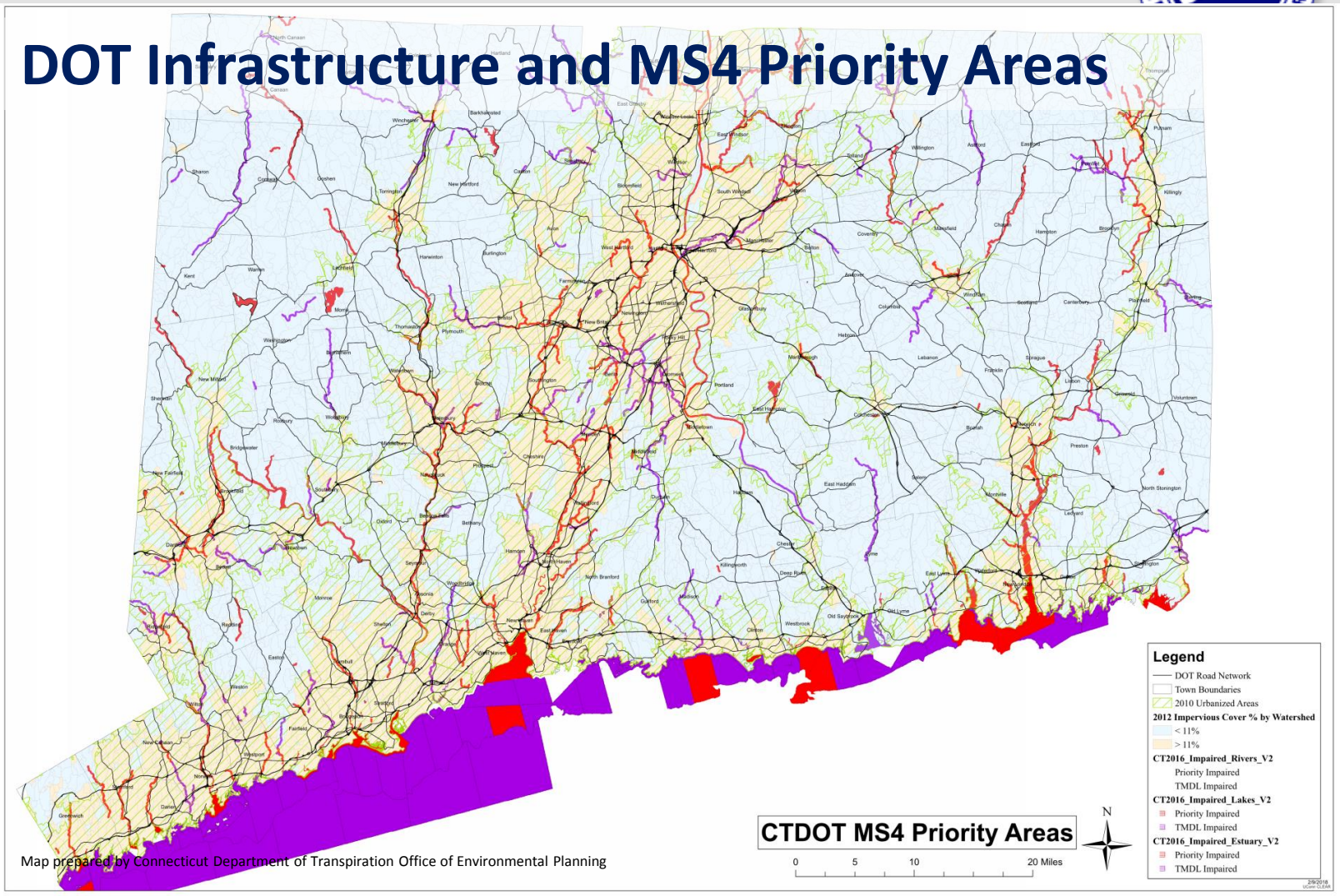
- Develop stand alone retrofit projects

Questions ?

DOT.MS4@ct.gov

DOT Infrastructure-Priority Areas

DOT Infrastructure and MS4 Priority Areas



DCIA DISCONNECTIONS

- Disconnections to be achieved through Stormwater BMPs on a project level

DISCONNECTED = the *WQV Retention Goal* is retained

= the *WQV Retention goal* is treated if it can't be retained

= the *WQV Retention goal* is retained and/or treated somewhere else within the DOT R.O.W. and within the same subregional drainage basin

Pre- and post-construction DCIA must be tracked for each project affecting drainage

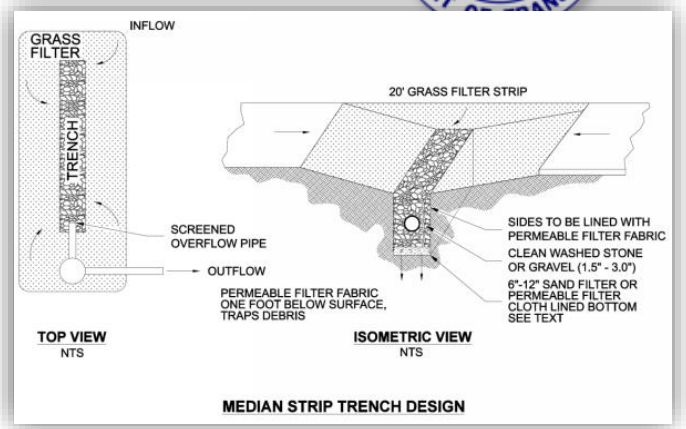


Image from the Washington DOT Highway Runoff Manual (Figure 5-44, Pg. 5-144) Dated April 2014 with supplement February 2016.
https://www.wsdot.wa.gov/publications/manuals/fulltext/M31-16/highwayrunoff.pdf

Image from the Washington DOT Highway Runoff Manual, Engineered Dispersion, Pg. 5-181) Dated April 2014 with supplement February 2016.
https://www.wsdot.wa.gov/publications/manuals/fulltext/M31-16/highwayrunoff.pdf